CLAIMS

What is claimed is:

1. An electro-mechanical battery, comprising:

a housing;

a central core fixedly disposed in said housing, said central core having an internal raceway structure thereon;

a composite rotor enclosed in said housing around said central core, said rotor configured to spin about its vertical axis in said housing;

one or more set of permanent magnet arrays on said internal raceway and disposed between said composite rotor and said central core;

a power input for storing a quantity of electrical power to said electro-mechanical battery; and

a power output for retrieving at least a portion of said quantity of electrical power from said electro-mechanical battery.

2. The electro-mechanical battery of claim 1, wherein said composite rotor comprises a plurality of closely spaced closed-circuit embedded conductive coils.

3. The electro-mechanical battery of claim 2, wherein said embedded conductive coils are wrapped around a first composite core, said first composite core comprising carbon fiber filaments bound in an epoxy matrix.

4. The electro-mechanical battery of claim 3, wherein said composite rotor further comprises a second composite core outwardly located from said first composite core and a plurality of strands of composite filaments wrapped around said first composite core and said second composite core, said second composite core comprising carbon fiber filaments bound in an epoxy matrix.

5. The electro-mechanical battery of claim 4, wherein said plurality of strands of composite filaments comprises a first carbon filament layer and a second carbon filament layer, said first carbon filament layer wrapped around said first composite core and said second composite core in a first continuous filament spiral-wound pattern.

6. The electro-mechanical battery of claim 5, wherein said second carbon filament layer is wrapped around said first carbon filament layer in a second continuous filament spiral-wound pattern, said second continuous filament spiral-wound pattern applied in a counter-rotating direction to said first continuous filament spiral-wound pattern.

7. The electro-mechanical battery of claim 6 further comprising a third carbon filament layer wrapped around said second carbon filament layer, said third carbon filament layer wrapped around said second carbon filament layer in sequential planes radial to the vertical axis of said rotor.

8. The electro-mechanical battery of claim 5, wherein said second carbon filament layer is wrapped around said first carbon filament layer in a pattern comprised of sequential planes radial to the vertical axis of said rotor.

9. The electro-mechanical battery of claim 1, wherein said one or more sets of permanent magnet arrays comprises a first ring of magnets forming an upper axial magnet array, a second ring of magnets forming a central radial magnet array and a third ring of magnets forming a lower axial magnet array.

10. The electro-mechanical battery of claim 9, wherein each of said sets of permanent magnet arrays is configured into a Halbach Array.

11. The electro-mechanical battery of claim 1, wherein each of said sets of permanent magnet arrays is configured into a Halbach Array.

12. The electro-mechanical battery of claim 1, wherein said composite rotor has a substantially teardrop-shaped cross-section.

13. The electro-mechanical battery of claim 1, wherein said rotor has an outside diameter to inside diameter ratio of approximately 2 to 1.

14. The electro-mechanical battery of claim 1 further comprising a conductive coil disposed between said composite rotor and said one or more sets of permanent magnet arrays.

15. The electro-mechanical battery of claim 14 further comprising an interface hub interconnecting said conductive coil to said composite rotor.

16. The electro-mechanical battery of claim 1, wherein said housing is evacuated prior to use of said electro-mechanical battery.

17. An electro-mechanical battery, comprising:

a mounting structure;

a central core disposed on said mounting structure, said core having an internal raceway structure thereon;

a composite rotor disposed around said central core, said rotor configured to spin about its vertical axis around said central core;

one or more set of permanent magnet arrays on said internal raceway and disposed between said composite rotor and said central core;

a power input for storing a quantity of electrical power to said electro-mechanical battery; and

a power output for retrieving at least a portion of said quantity of electrical power from said electro-mechanical battery.

18. The electro-mechanical battery of claim 17, wherein said composite rotor comprises a plurality of closely spaced closed-circuit embedded conductive coils.

19. The electro-mechanical battery of claim 18, wherein said embedded conductive coils are wrapped around a first composite core, said first composite core comprising carbon fiber filaments bound in an epoxy matrix.

20. The electro-mechanical battery of claim 19, wherein said composite rotor further comprises a second composite core outwardly located from said first composite core and a plurality of strands of composite filaments wrapped around said first composite core and said second composite core, said second composite core comprising carbon fiber filaments bound in an epoxy matrix.

21. The electro-mechanical battery of claim 20, wherein said plurality of strands of composite filaments comprises a first carbon filament layer and a second carbon filament layer, said first carbon filament layer wrapped around said first composite core and said second composite core in a first continuous filament spiral-wound pattern.

22. The electro-mechanical battery of claim 21, wherein said second carbon filament layer is wrapped around said first carbon filament layer in a second continuous filament spiral-wound pattern, said second continuous filament spiral-wound pattern applied in a counter-rotating direction to said first continuous filament spiral-wound pattern.

23. The electro-mechanical battery of claim 22 further comprising a third carbon filament layer wrapped around said second carbon filament layer, said third carbon filament layer wrapped around said second carbon filament layer in sequential planes radial to the vertical axis of said rotor.

24. The electro-mechanical battery of claim 17, wherein said one or more sets of permanent magnet arrays comprises a first ring of magnets forming an upper axial magnet array, a second ring of magnets forming a central radial magnet array and a third ring of magnets forming a lower axial magnet array.

25. The electro-mechanical battery of claim 24, wherein each of said sets of permanent magnet arrays is configured into a Halbach Array.

26. The electro-mechanical battery of claim 17, wherein said composite rotor has a substantially teardrop-shaped cross-section.

27. The electro-mechanical battery of claim 17, wherein said rotor has an outside diameter to inside diameter ratio of approximately 2 to 1.

28. A composite flywheel rim, comprising:

a plurality of hoop-wound filaments bound in an epoxy matrix forming a composite core; and

a first layer of continuous composite filament wound in a first continuous filament spiral-wound pattern around said composite core.

29. The composite flywheel rim of claim 28, where in said composite core is formed in a generally teardrop shape.

30. The composite flywheel rim of claim 28, wherein said rim has an outside diameter to inside diameter ratio of approximately 2 to 1.

31. The composite flywheel rim of claim 28, wherein said composite core comprises carbon fiber filaments bound in an epoxy matrix.

32. The composite flywheel rim of claim 28 further comprising a second layer of continuous composite filament wound in a continuous filament spiral-wound pattern around said first layer of continuous composite filament, said second continuous filament spiral-wound pattern applied in a counter-rotating direction to said first continuous filament spiral-wound pattern.

33. The composite flywheel rim of claim 32 further comprising a third carbon filament layer wrapped around said second carbon filament layer, said third carbon filament layer wrapped around said second carbon filament layer in sequential planes radial to the vertical axis of said composite flywheel rim.

34. The composite flywheel rim of claim 28, wherein said composite rim comprises a plurality of closely spaced closed-circuit embedded conductive coils.

35. The composite flywheel rim of claim 34, wherein said conductive coils are wrapped around said composite core and said composite flywheel rim further comprises a second composite core disposed around said conductive core, wherein said first layer of continuous composite filament is wound around both said composite core and said second composite core.

36. The composite flywheel rim of claim 35 further comprising a second layer of continuous composite filament wound in a continuous filament spiral-wound pattern around said first layer of continuous composite filament, said second continuous filament spiral-wound pattern applied in a counter-rotating direction to said first continuous filament spiral-wound pattern.

37. The composite flywheel rim of claim 36, wherein said composite core is formed in a generally teardrop shape.

38. The composite flywheel rim of claim 36, wherein said rim has an outside diameter to inside diameter ratio of approximately 2 to 1.

39. A passive magnetic bearing, comprising:

a plurality of closely spaced closed-circuit conductive coils wrapped around a core of non-conductive material; and

one or more sets of permanent magnet arrays disposed on a base structure, said magnet arrays configured to magnetically interact with said conductive coils when said conductive coils pass by said magnet arrays so as to levitate an object connected to said conductive coils.

40. The passive magnetic bearing of claim 39, wherein said magnet arrays are configured in a Halbach Array.

41. The passive magnetic bearing of claim 39, wherein said core comprises a plurality of carbon fiber filaments bound in an epoxy matrix.

42. The passive magnetic bearing of claim 39, wherein said conductive coils are embedded in said object.

43. The passive magnetic bearing of claim 42, wherein said object is a rotor.

44. The passive magnetic bearing of claim 39 further comprising a plurality of strands of composite filaments wrapped around said conductive coil and said object so as to join said conductive coils to said object.

45. The passive magnetic bearing of claim 39, wherein said one or more sets of permanent magnet arrays comprises at least three sets of magnet arrays, at least two of said sets providing axial stability and at least one of said sets providing radial stability for said object.

46. The passive magnetic bearing of claim 39, wherein said base structure has an internal raceway structure thereon, said one or more sets of permanent magnet arrays mounted on said internal raceway structure.

47. The passive magnetic bearing of claim 46, wherein said internal raceway structure is v-shaped.